

**What Is Claimed Is:**

1. An isolated polypeptide having  $\beta,\beta$ -carotene 15,15'-monooxygenase activity comprising SEQ ID NO: 1 or a polypeptide having  $\beta,\beta$ -carotene 15,15'-monooxygenase activity and being at least 60% homologous to SEQ ID NO: 1 as determined by the Wisconsin Sequence Analysis Package GCG, Version 9.1 (1997).
2. An isolated polypeptide according to claim 1 wherein the polypeptide is at least 70% homologous to SEQ ID NO: 1.
3. An isolated polypeptide according to claim 1 wherein the polypeptide is at least 80% homologous to SEQ ID NO: 1.
4. An isolated polypeptide according to claim 1 wherein the polypeptide is at least 90% homologous to SEQ ID NO: 1.
5. An isolated polypeptide according to claim 1 which is derived from chicken.
6. An isolated nucleic acid sequence encoding the polypeptide of claim 1.
7. An isolated nucleic acid sequence according to claim 6 which comprises SEQ ID NO: 2 or a fragment thereof.
8. An isolated nucleic acid sequence according to claim 7 wherein the fragment has at least 20 bases.
9. An isolated nucleic acid sequence according to claim 7 wherein the fragment has at least 30 bases.

10. An isolated nucleic acid sequence according to claim 6 wherein the nucleic acid is a deoxyribonucleic acid.
11. An isolated nucleic acid sequence according to claim 6 wherein the nucleic acid is an antisense ribonucleic acid.
12. A primer for amplifying a gene coding for a polypeptide having  $\beta,\beta$ -carotene 15,15'-monooxygenase activity which primer comprises a fragment of the nucleic acid sequence according to claim 6.
13. A probe for detecting a gene coding for a polypeptide having  $\beta,\beta$ -carotene 15,15'-monooxygenase activity which probe comprises a fragment of the nucleic acid sequence according to claim 6.
14. A test kit for amplifying and/or detecting a gene or a fragment thereof coding for  $\beta,\beta$ -carotene 15,15'-monooxygenase wherein the test kit comprises at least one primer according to claim 12.
15. A test kit for amplifying and/or detecting a gene or a fragment thereof coding for  $\beta,\beta$ -carotene 15,15'-monooxygenase wherein the test kit comprises at least one probe according to claim 13.
16. An antibody which specifically reacts with a polypeptide according to claim 1.
17. An immunoassay for the detection and/or quantification of  $\beta,\beta$ -carotene 15,15'-monooxygenase which comprises at least one antibody according to claim 16.

18. A process for the production of vitamin A comprising enzymatically cleaving  $\beta$ -carotene with a polypeptide according to claim 1.

19. A method for introducing a  $\beta,\beta$ -carotene 15,15'-monooxygenase cDNA into a host cell comprising introducing a cDNA coding for the polypeptide of claim 1 into a vector suitable for the host cell and introducing the vector into the host cell.

20. A method according to claim 19 wherein the host cell is a plant cell.

21. A method according to claim 19 wherein the host cell is a prokaryotic cell.

22. A method according to claim 19 wherein the host cell is a yeast cell or a fungal cell.

23. A method according to claim 19 wherein the host cell is an alga cell.

24. A method according to claim 19 wherein the host cell is a mammalian cell.

25. A method according to claim 24 wherein the mammalian cell is a human cell.

26. A host cell obtained by the method of claim 19.

27. A host cell according to claim 26 which comprises a  $\beta,\beta$ -carotene 15,15'-monooxygenase cDNA obtained from another species.

27. An isolated polynucleotide which encodes  $\beta,\beta$ -carotene 15,15'-monooxygenase comprising SEQ ID NO: 2.

28. An isolated polynucleotide according to claim 27 which consists essentially of SEQ ID NO: 2.

29. An isolated polynucleotide according to claim 27 which consists of SEQ ID NO: 2.

30. A vector comprising the polynucleotide of SEQ ID NO: 2.

31. A host cell transformed with the vector of claim 30.

32. An isolated polypeptide having  $\beta,\beta$ -carotene 15,15'-monooxygenase activity comprising SEQ ID Nos: 1 or 4.

33. A primer set for amplifying a polynucleotide encoding  $\beta,\beta$ -carotene 15,15'-monooxygenase comprising SEQ ID NO: 8 as a 5' primer and SEQ ID NO: 9 as a 3' primer.

34. A primer set for amplifying a polynucleotide encoding  $\beta,\beta$ -carotene 15,15'-monooxygenase comprising a polyT/Not reverse primer and SEQ ID NO:10 as a forward primer.

35. A kit for amplifying and/or detecting a polypeptide or fragment thereof encoding  $\beta,\beta$ -carotene 15,15'-monooxygenase comprising at least one primer selected from the group consisting of SEQ ID Nos: 8, 9, and 10.